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⑤④ Absorbent floor mat

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## Description

The present invention is directed to mats as outlined in the preamble of claim 1, useful for protecting floor surfaces from being soiled by contact with dirty liquids or other sources of dirt or contamination. A mat of this type is disclosed in US-A-4285075. The known mat comprises a re-usable or a disposable container-like holder enclosing a removable absorbent pad. The absorbent pad itself may be a sanitary pad of the type as developed for disposable diapers. The pad has a permeable cover sheet and an impermeable back sheet enclosing absorbent material. The known mat is adapted to be placed on the floor around the base of a commode or urinal. Since pads as used for disposable diapers are not very resistant to wear, the holder includes a grille work which is provided as top wear surface and is part of the holder structure.

Other known mats for use in areas especially subjected to wear are either durable and relatively costly or paper-like and intended to be discarded after a brief period of use.

Examples of the former range from carpeting, throw rugs, and other woven or tufted fabric mats while the latter types principally are made of paper-like materials such as are commonly found in new automobiles or runners used in protecting carpeting in newly constructed housing. There have, however, been investigated other structures designed for applications having somewhat more demanding requirements but where disposability or limited use require low costs. For example, U.S. Patent 3,856,610 to Bruneel dated 24 December 1974 describes a floor mat having an absorbent body portion which may be a woven or nonwoven fibrous fabric, fiberboard, paperboard, cotton or the like that is contained within a liquid impervious skin. The skin is perforated on the upper surface to permit liquid to pass through and into a series of aligned pores in the body member. It is alleged that liquid and small particles become entrapped in the pores and retained. U.S. Patent 4,421,809 to Bish, Sagel and Trinh dated 20 December 1983 describes a floor mat having a flocked surface that is bonded by means of a hydrophilic adhesive to an impermeable polymeric film. This combination may be further bonded to an absorbent secondary backing which may have an adhesive surface for improved hard floor stability. This structure may include a nonwoven primary backing in place of the film, but the film is preferred to maintain a thin structure. U.S. Patent 4,143,194 to Wihksne dated 06 March 1979 describes a disposable floor mat and holder combination wherein the mat may constitute tacky sheets, and the holder has means for reinforcing bevelled surfaces and may include interlocking means for combining mats to produce a larger surface.

In spite of these teachings, there is not commercially available, as far as is known, a floor mat that is sufficiently durable for use at entryways and the like without a grill work structure and yet is sufficiently low cost that its use may be consistent with disposability. Such a mat would avoid the high cost of woven and other relatively permanent structures and provide effective service. Furthermore, such a mat having a relatively limited life that could be used for advertising and promotional purposes is desired if available at a sufficiently low cost that it could be frequently changed.

It is therefore an object of the present invention to provide a mat which is sufficiently durable for use in entryways and the like and which is sufficiently low in cost that its use may be consistent with disposability.

A mat of this type is disclosed in claim 1.

The inventive mat can be used over an extended period compared with conventional more paper-like protective mats. The absorbent material is a fast-wicking microfiber web and preferably is a combination of thermoplastic polymeric microfibers and wood pulp fibers that not only is highly absorbent for both water and oil based liquids, but has a strong tendency to retain such materials and keep them from being redistributed on subsequent contact with the wear surface. The result of such combination is a highly effective floor mat that is inexpensive and suitable for many applications including building entryways, vending machine areas, clean rooms, hospitals, industrial laboratories, and the like.

Preferred embodiments of the inventive mat are described in dependent claims 2 to 16. Preferred embodiments for the wear surface include chemically bonded continuous filament webs, and preferred embodiments for the impervious film include films of polyolefins such as polypropylene and polyethylene. The combination is preferably bonded by a pattern application of sonic energy or heat and pressure.

In use the mat may be retained in place by means of adhesive applied to the impervious backing, or by means of a holder which is relatively permanent as compared with the mats which are intended to be changed from time to time depending on the extent of use.

Preferred embodiments of the invention are hereinafter described with reference to the drawings.

Figure 1 is an illustration shown in partial cross-section of a mat in accordance with the present invention.

Figure 2 is a view like that of Figure 1 showing the mat in combination with a holder.

The present invention provides an improved floor mat that is highly absorbent and finds applications as protection at building entryways, clean rooms, laboratories, hospitals, and the like where there is high traffic likely to bring in water, dirt, or other contaminants. The floor mat of the present invention is highly effective

yet may be produced at a low cost consistent with disposability. Thus, the mat may include graphics of widely varying descriptions including advertisements, logos, and the like which may be changed frequently. These benefits and advantages are attained as a result of the specific structure of the mat which combines an abrasion-resistant nonwoven wear layer with a highly absorbent microfiber inner layer which may include cellulose or other fibers in combination with a bottom surface or film that is liquid impervious. In preferred embodiments the structure also includes means for retaining the mat either such as through the use of adhesives and/or a mat holder. The combination may be bonded by various means but is preferably bonded by a patterned application of sonic energy or heat and pressure.

The abrasion-resistant wear surface in accordance with the invention is preferably a chemically, overall bonded continuous filament web. Such webs of nylon are available, for example, under the trademark Cerex<sup>1/4</sup>® from Monsanto. It is important that the wear surface be highly resistant to abrasion and impart durability to the structure. Webs that are solution spun, solvent treated, or bonded by other chemical means are preferred for appearance purposes and for increased durability. While the basis weight of this wear layer may vary, for example, broadly within the range of about 15 to 200 grams per square meter, it is preferably within the range of about 50 to 70 grams per square meter. In order to satisfy the requirements of the present invention, the continuous filament wear layer web must have an abrasion resistance of at least about 3-1/2 hours and preferably at least about 5 hours as measured by a modification of the Tetrapod Walker Test which simulates flat floor traffic.

In accordance with this procedure, a plastic canister of 8.5 inches (21.59 cm) diameter and 8.5 inches (21.59 cm) length was fitted with rubber strips wrapped outside its circumference. A tetrapod was formed by welding together at equal angles four 1/4 inch (0.635 cm) screws three inches (7.62 cm) in length in the configuration of a large "jack". A neoprene #7 stopper was attached to each screw, and a lead weight attached to the vertex to make the final weight 1.1 Kg. To carry out the test, a section of mat material 8.5 inches (21.59 cm) by 24.75 inches (62.86 cm) was placed securely about the inner circumference of the canister. The tetrapod was then placed in the canister and the lid secured. The canister was placed on its side on a roller mill and the speed adjusted to 60 rpm. The sample was checked at 1/4 or 1/2 hour intervals for holes, rips or snags.

In addition, the wear surface, in accordance with the invention, will have a porosity in the range of from at least about 100 cubic feet (5.66 m<sup>3</sup>) per minute, preferably at least about 200 cubic feet per minute as measured using a Frazier Air-Permeability tester (Frazier Precision Instrument Company). To achieve desired integrity, the porosity normally will not exceed about 500 cubic feet (14.16 m<sup>3</sup>) per minute, however. In accordance with this procedure, a sample of sufficient size to extend several inches over all sides of the retaining ring was placed over the orifice having a diameter of 2.75 inches (6.98 cm). The retaining ring was fitted in position, and the clamp lowered and tightened. The power was adjusted until the inclined manometer oil column reached 0.5. When the inclined manometer had steadied at the proper level, a reading was taken from the vertical manometer and converted to a flow rate using the equipment calibration table. While other nonwoven chemically overall bonded webs are available of synthetic polymers such as polyolefins, polyesters, and the like, nylon webs, in the structure of the present invention are particularly advantageous in that they may easily be printed and resist discoloration or staining thus extending the useful life of the mat.

The absorbent microfiber layer structure is also an essential feature of the present invention. It preferably combines an intimate admixture of thermoplastic microfibers with other fibers such as wood pulp or natural or synthetic staple fibers having a basis weight in the range of from about 100 to 500 grams per square meter, preferably about 150 to 250 grams per square meter. The composition may range from about 0 to 80 percent of the other fibers, and is preferably in the range of from about 60 to 80 percent wood pulp fibers by weight. The microfibers are preferably thermoplastic polymers such as polyolefins, polyesters or polyamides having a diameter on the average in the range of up to about 15 microns and, preferably, in the range of up to about 10 microns.

The absorbent layer may be and is preferably formed in accordance with the process described in U.S. Patent 4,100,324 to Anderson, Sokolowski and Ostermeier dated 11 July 1978, which is incorporated herein by reference in its entirety. Thus, a matrix of meltblown microfibers is formed by depositing streams of molten polymer into an airstream and combining is accomplished by a secondary airstream containing, for example, wood pulp fibers. The combination of the airstreams causes the wood pulp fibers to be distributed throughout and held within the microfiber matrix. Preferred materials for the meltblown microfiber component include polyolefins such as polypropylene and polyethylene, although other microfibers may be used as will be apparent to those skilled in the art. If staple fibers are included, they may be polyester, polyolefins, polyamides or mixtures thereof, for example. However constituted, the absorbent microfiber web will have an absorbent capacity such that the capacity for the mat product will be generally in the range of at least about 1,000 gsm preferably at least about 1,400 gsm, absorbency rate generally in the range of up to about 2.5 seconds, preferably no greater than 0.5 seconds, and wicking rate generally so as to provide results for the mat combination in the

range of at least about 100 quarter inch squares (squares of 6,35 mm by 6,35 mm) and preferably about at least 200 quarter inch squares (squares of 6,35 mm by 6,35 mm). Absorbency capacity was determined essentially in accordance with Federal Specification UU-T-00595 (GSA-FSS) Sections 4.4.4 and 4.4.6 by submerging a sample in water for 3 minutes, removing it, and allowing it to drip for 1 minute. Absorbency rate was determined essentially in accordance with Federal Specification UU-P-31b, 3 March 1949, Method 180 by measuring the time taken for a sample to completely absorb 0.1 ml. water. Wicking rate results were obtained by placing a 12 inch by 12 inch (30,48 cm by 30,48 cm) sample on a plexiglass surface, holding a pipet containing 5.0 ml of a solution of 0.02% aqueous FD & C red #4 dye 2 cm above the sample, and allowing the solution to flow vertically onto the sample. After five minutes, the number of quarter inch squares (mm<sup>2</sup>) of area covered by the solution was measured. For the mat as a whole, the absorbency rate is generally within the range of up to 20 seconds, and, preferably, up to 10 seconds.

The liquid impervious surface for the combination in accordance with the invention is preferably a film selected from those which are suitable for combination with the other layers and yet provide the desired barrier properties. Such include, by way of example and not limitation, thermoplastic polymers such as polyolefins, polyesters and the like. Preferred for economic reasons as well as for improved bonding are polyethylene or polypropylene films. The film will, in general, have a thickness in the range of from about 0.5 to 5 mils (0,0217 mm to 0,217 mm), preferably in the range of from about 0.75 to 1.5 mils (0,019 mm to 0,038 mm) for the best combination of economics and performance. Essentially the film will need to be thick enough to withstand being subjected to repeated treading without breaking or rupturing and yet should be thin enough so as to not impart undue rigidity to the structure. The film may be applied as a separate layer, coextruded, or coated onto the absorbent web. Alternative means may be used to obtain imperviousness, such as calendering the exposed absorbent surface, or the bottom adhesive layer may be impervious.

Since the intended application as a floor mat will subject the combination to wet or otherwise slippery conditions, it is preferred that some means be provided to assure that the mat will maintain its position and not slip on the floor. This may be accomplished by means of a holder device, or, more economically, by means of tacky adhesive applied to the exposed surface of the liquid impervious film. Such adhesives may be selected from those pressure-sensitive adhesives which are known to retain their tack for an extended period under wet conditions. Such include, for example, latex acrylic adhesives. Preferably the adhesive constitutes Nacor-38-4529<sup>®</sup> acrylic latex available from National Starch and is applied overall or in a pattern covering up to about 100 percent of the exposed surface and is such as to result in easy releasability when it is desired to change the mat. For further discussion of such adhesives, reference may be had to U.S. Patent 4,421,809 to Bish, Sagel, and Trinh, for example, beginning at column 6, line 19, which is incorporated herein by reference.

When a holder is desired, it may be one of those known for use in holding floor mats. As such, it will generally have bevelled edges and be of a size such as to accommodate the mat without being so large as to permit the mat to be easily dislodged. If desired, retaining means may be incorporated in the holder to further ensure against undesired separation, or the mat may include an adhesive as above described for attachment to the holder. Other attachment means may be employed as will be apparent to those skilled in the art. If an adhesive is used, it will preferably be a permanently tacky pressure sensitive adhesive of the type described above and a release liner will preferably be used to protect the adhesive prior to the mat being placed in position. When it is desired to secure the mat, the release liner is removed, and the mat pressed into a desired position. Such release liners are known and may include plastic sheets such as 1 mil (0,0254 mm) thick polyethylene or a spunbonded nonwoven of 0.5 oz/square yard (16,95 g/m<sup>2</sup>), for example, or paper treated with a release coat of silicone, polytetrafluoroethylene or other strippable material.

Bonding of the composite may be accomplished by a variety of means including adhesives, heat and pressure, stitching or application of sonic energy. It is important, however, that bonding be accomplished in a manner that does not adversely affect the wear resistant properties of the spunbonded top surface or the absorbency and wicking properties of the microfiber mat. Also, since the spun-bonded surface must transmit liquid into the absorbent layer, the bonding must preserve the porosity or open structure of the web. Therefore, bonding is achieved in a pattern that will generally occupy up to about 25 percent of the surface and, preferably, up to about 10 percent of the surface. The pattern may comprise an open, disconnected pattern, or it may comprise a series of lines. If an open, disconnected pattern is used, it will generally be in a pattern of up to about 30 bonds per square inch (about 4,65 bonds per cm<sup>2</sup>) and preferably have up to about 20 bonds per square inch (about 3,1 bonds per cm<sup>2</sup>). If a line pattern is used, it will generally be in a pattern of up to about 10 lines per inch (about 4 lines per cm) on the average in any direction and preferably average up to about 5 lines per inch (about 2 lines per cm) in any direction. The preferred means for achieving bonding is application of sonic energy since that has been found to be most effective for combinations of the total basis weight of the present invention and for achieving bonding of different polymer components. For some applications, combinations of the different bonding steps may be employed.

Turning to the drawings, Figure 1 illustrates a mat in accordance with the present invention shown in partial cross-section. As illustrated, the mat 20 includes wear surface spunbonded layer 10, absorbent layer 12 including microfibers 22 and wood pulp fibers 24 and liquid impervious film 14. The combination is united by bond areas 16 and includes adhesive strips 18 for attachment to the floor surface.

Figure 2 is a view like that of Figure 1 further illustrating the embodiment wherein the mat 20 is combined with holder 26 which may be of a variety of materials suited for the intended use. Thus, if intended as a permanent embodiment, the support holder 26 may be of a durable material such as rubber or, if used only temporarily, may be of a less expensive material such as polystyrene, polypropylene, polyurethane or the like. In any event, holder 26 preferably includes bevelled sides 28 and will have a gripping under surface 30 to avoid slipping on a wide variety of floor surfaces, such as carpet, tile, linoleum, concrete, wood and so forth. In this application, as shown, the impervious surface 14 may be free of adhesive, or, if desired, adhesive may be used to secure the mat to the holder.

The mats of the present invention either alone or in combination with the holder, will find a wide variety of applications. For example, they may be used as either temporary or permanent fixtures at building entryways to protect against inclement weather or otherwise tracking in outside dust and dirt. Also they may be employed in industrial applications at entryways to cleanrooms, laboratories, or as undermats for automotive repair. Further, they may be used in hospitals to reduce opportunities for contamination. Other uses including household applications will be apparent to those skilled in the art. For many of these applications the particular advantage of the printability of a nylon or other receptive outer surface may be used to achieve advertising or other promotional purposes such as safety messages or the like. The low cost of the mats in the present invention make them particularly suitable since they may be changed to impart different messages on a relatively frequent basis.

#### Example

A mat in accordance with the present invention was constructed generally as illustrated in Figure 1. For the outside wear surface, a nylon web obtained from Monsanto under the trademark Cerex<sup>®</sup> was used. This web was formed of chemically bonded 3 denier continuous nylon filaments and had a basis weight of 68 grams per square meter and a porosity of 140 cubic feet (3.94 m<sup>3</sup>) per minute. For the absorbent layer a web produced generally in accordance with U.S. Patent 4,100,324 to Anderson, Sokolowski and Ostermeier and, in particular, with reference to Example 1, was employed. This layer had a basis weight of 190 grams per square meter and included 30 percent polypropylene microfibers and 70 percent wood pulp. It had an absorbency rate that was essentially instantaneous. For the liquid impervious film layer, a film of polyethylene having a basis weight of about 31 grams per square meter and thickness of 1.5 mils (0.038 mm) was employed. The combination was bonded by application of sonic energy at a frequency of 20 to 40 kilohertz and in a pattern corresponding to the gross pattern illustrated in U.S. Patent 4,374,888 to Bornslaeger dated 22 February 1983, Figure 3 having a frequency of about 20 bonds per square inch (about 3.1 bonds per cm<sup>2</sup>) and percent coverage of about 8 percent. The surface of the mat was printed with a decorative pattern.

In use the mat of this Example was placed in a rectangular holder and located at the entryway to offices and factories in the northeast section of the United States during a period of highly inclement weather including two blizzards and one week of rain for a total precipitation of about 15 inches. After a period of 31 days with an estimated traffic of 3,000 to 5,000 persons, the mat was still fully intact although the appearance had deteriorated due to dirt retention.

The mat material of this example was further tested to determine its absorbency capacity and wicking rate. For comparison, similar tests were performed on other conventional paper and nondisposable cloth mat materials. The results are shown in the following Table.

TABLE

5	Sample	Water rate (seconds)	Water capacity gsm	Wicking 1/4" squares (squares of 6,35 mm by 6,35 mm)	Tetrapod
10	Paper (117.6 gsm)	13.4	187.6	754	3 hours— one hole considerable wear
	Calendered paper (92.1 gsm)	Did not absorb	92.4	Did not absorb	5 hrs.*
15	Calendered paper (117 gsm)	11.9	199.3	579	5 hrs.*
	Paper (83.7 gsm)	0.3	823.6	136	1 hour—failed holes
20	Paper (306.1 gsm)	19.7	1881.6	50	1 hr 10 min failed—holes— much pilling
	Air laid paper (75.6 gsm)	Instant	694.3	167	5 min—failed— holes
25	Rental-cotton (3022 gsm)	37.2	3701.9	Essentially** Zero	5 hrs—some pilling, no holes
	Rental-nylon (2660 gsm)	35.3	4022.0	Essentially** Zero	Not done
30	Rental-cotton used (2011 gsm)	40.0	2257.0	31	Not done
	Example (315 gsm)	7.1	1487.8	143	5 hrs—some pilling, no holes

\*Due to paper being highly calendered, test results are not believed to reflect true abrasion resistance.  
 \*\*"Z" directional transfer only.

These data demonstrate that the mats of the present invention provide benefits approaching and, in some cases, exceeding those of the more expensive reusable cloth ones at a cost consistent with disposability. While individual results in some cases do not measure up to those of competitive disposable products, taken as a whole, and particularly as shown by tests in use, the floor mats of the present invention are preferred over such conventional disposable products. The engineered construction of the mats of the present invention extend performance by wicking liquid and soil contained therein away from the exposed surface while preventing its transfer through the impervious bottom surface. The top wear layer protects the absorbent medium while permitting the soil to penetrate to avoid surface build-up and further contributes to extend the useful life of the mat.

Thus it is apparent that there has been provided, in accordance with the invention, an improved floor mat construction that fully satisfies the objects, aims, and advantages set forth above. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description.

#### Claims

1. A mat (20) for protecting floor surfaces, comprising a fiber material having an absorbent inner layer (12).

a nonwoven web forming cover surface (10) at one side of said inner layer and an impervious surface (14) on the side of said inner layer opposite said cover surface, characterized by

said absorbent inner layer (12) having a basis weight generally in the range of from about 150 to 250 g/m<sup>2</sup> comprising microfibers (22, 24) having an absorbency capacity in the range of from about 2152,85 to 9687,84 g/m<sup>2</sup> (200 to 900 g/sq. ft.) and absorbency rate in the range of up to about 2.5 seconds,

said cover surface comprising a wear surface (10) containing a continuous filament nonwoven web having a basis weight generally in the range from about 15 to 200 g/m<sup>2</sup> and an abrasion resistance of at least about 3 1/2 hours, measured by a modification of the Tetrapod Walter test which simulates a flat floor traffic under a final load of 1,1 kg and

said mat (20) being bonded by a spaced pattern of bond areas (16) occupying up to about 25% of the surface area and having a wicking rate in the range of at least about 100 squares of 6,35 mm by 6,35 mm (100 quarter-inch squares).

2. The mat of claim 1 wherein said inner layer (12) comprises an admixture of said microfibers with 0 to 80% of other fibers selected from the group consisting of wood pulp fibers and staple fibers and mixtures containing wood pulp and staple fibers.

3. The mat of claim 2 wherein said microfibers of said absorbent inner layer (12) comprise meltblown polypropylene microfibers.

4. The mat of any of claims 1 to 3 wherein said wear surface (10) comprises nylon filaments.

5. The mat of any of claims 1 to 4 wherein said liquid impervious surface (14) is a polymeric film having a thickness in the range of from about 0,0217 to 0,217 mm (0.5 to 5 mils).

6. The mat of claim 5 wherein the film (14) is a polyethylene film having a thickness in the range of from about 0,018 to 0,038 mm (0.75 to 1.5 mils).

7. The mat of any of claims 1 to 6 in combination with means (18, 26) to maintain its position.

8. The mat of claim 7 wherein said maintaining means is a pressure-sensitive adhesive (18) applied to the impervious surfaces (14).

9. The mat of claim 7 wherein said maintaining means is a holder (26) to contain said mat (20).

10. The mat of any of claims 1 to 9 wherein said mat component having an absorbency capacity in the range of from about 3229,28 to 5382,13 g/m<sup>2</sup> (300 to 500 g/sq. ft.) and absorbency rate in the range of up to about 0.5 sec.

11. The mat of claim 3 wherein said wear surface (10) comprises continuous nylon filaments having a basis weight in the range of from about 50 to 70 g/m<sup>2</sup> (1.5 to 2.0 oz/yds<sup>2</sup>).

12. The mat of any of claims 1 to 11 wherein said wear surface (10) has an abrasion resistance of at least about 5 hours.

13. The mat of any of claims 1 to 12 wherein said wear surface (10) has a porosity in the range of from about 3,94 to 14,16 m<sup>3</sup>/min (140 to 500 cubic feet per minute).

14. The mat of any of claims 1 to 13 wherein said pattern of bond areas (16) occupies up to 10% of the surface area.

15. The mat of any of claims 1 to 14 wherein said continuous filament nonwoven web of said wear surface (10) is bonded chemically.

#### Patentansprüche

1. Matte (20) zum Schutz von Bodenoberflächen aus einem Fasermaterial mit einer absorbierenden, inneren Schicht (12), einer ungewebten Bahn, die eine Abdeckschicht (10) an einer Seite der inneren Schicht bildet, und einer undurchlässigen Oberfläche (14), an der der Abdeckfläche gegenüberliegenden Seite

der inneren Schicht, **gekennzeichnet durch** die absorbierende innere Schicht (12), die ein Basisgewicht aufweist, das im wesentlichen im Bereich zwischen etwa 150 bis 250 g/m<sup>2</sup> liegt, Microfasern (22, 24) mit einer Absorptionskapazität im Bereich von etwa 2152,85 bis 9687,84 g/m<sup>2</sup> (200 bis 900 g/sq. ft.) und mit einer Absorptionsrate im Bereich von bis zu etwa 2,5 Sekunden enthält, durch eine Abdeckfläche, die eine Verschleißfläche (10) aufweist, die eine nicht gewebte aus kontinuierlichen Filamenten bestehende Bahn aufweist mit einem Basisgewicht im allgemeinen im Bereich zwischen etwa 15 bis 200 g/m<sup>2</sup> und einen Abriebwiderstand von mindestens etwa 3 1/2 Stunden, gemessen nach einer Modifikation des Tetrapod-Walker-Versuchs, der einen Verkehr auf einem flachen Boden unter einer Endlast von 1,1kg simuliert, und wobei die Matte (20) durch ein beabstandetes Muster von Verbindungsflächen (16) verbunden ist, das bis zu 25 Prozent der Oberfläche einnimmt, und eine (Saug-)Rate im Bereich von mindestens hundert Quadraten von 6,35 mm x 6,35 mm (100 Viertelinchquadrate) aufweist.

2. Matte nach Anspruch 1, wobei die innere Schicht (12) eine Mischung der Microfasern mit 0 bis 80 Prozent von anderen Fasern enthält, die aus der Gruppe ausgewählt wurden, die Fasern aus Holzpulpe und Stapelfasern und Mischungen aus Holzpulpe- und Stapelfasern enthält.
3. Matte nach Anspruch 2, wobei die Microfasern der absorbierenden inneren Schicht (12) schmelzgeblasene Polypropylen-Microfasern enthalten.
4. Matte nach einem der Ansprüche 1 bis 3, wobei die Verschleißfläche (12) Nylon-Filamente enthält.
5. Matte nach einem der Ansprüche 1 bis 4, wobei die flüssigkeitsundurchlässige Oberfläche (14) ein Polymerfilm mit einer Dicke im Bereich von etwa 0,0217 bis 0,217 mm (0,5 bis 5 mils) ist.
6. Matte nach Anspruch 5, wobei der Film (14) ein Polyethylenfilm mit einer Dicke im Bereich von etwa 0,018 bis 0,038 mm (0,75 bis 1,5 mils) ist.
7. Matte nach einem der Ansprüche 1 bis 6 in Verbindung mit einer Einrichtung (18, 26) um ihre Lage aufrechtzuerhalten.
8. Matte nach Anspruch 7, wobei die Einrichtung zum Aufrechterhalten ein drucksensibler Kleber (18) ist, der auf die undurchlässige Oberfläche (14) aufgebracht ist.
9. Matte nach Anspruch 7, wobei die Einrichtung zum Aufrechterhalten ein die Matte (20) enthaltender Halter (26) ist.
10. Matte nach einem der Ansprüche 1 bis 9, wobei der Mattenbestandteil eine Absorptionsfähigkeit im Bereich von etwa 3229,28 bis 5382,13 g/m<sup>2</sup> (300 bis 600 g/sq. ft.) und eine Absorptionsrate im Bereich von bis zu etwa 0,5 Sekunden hat.
11. Matte nach Anspruch 3, wobei die Verschleißoberfläche (10) kontinuierliche Nylonfilamente mit einem Basisgewicht im Bereich von etwa 50 bis 70 g/m<sup>2</sup> (1,5 bis 2,0 oz/yds<sup>2</sup>) enthält.
12. Matte nach einem der Ansprüche 1 bis 11, wobei die Verschleißoberfläche (10) einen Abriebwiderstand von mindestens etwa 5 Stunden hat.
13. Matte nach einem der Ansprüche 1 bis 12, wobei die Verschleißoberfläche (10) eine Porosität im Bereich von etwa 3,94 bis 14,16 m<sup>3</sup>/min (140 bis 500 cubic feet pro Minute).
14. Matte nach einem der Ansprüche 1 bis 13, wobei das Muster verbundener Flächen (16) bis zu 10 Prozent der Oberfläche einnimmt.
15. Matte nach einem der Ansprüche 1 bis 14, wobei die Fließbahn aus kontinuierlichen Filamenten der Verschleißoberfläche (10) chemisch gebunden ist.

## Revendications

1. Paillason (20), pour la protection de surfaces au sol, comprenant un matériau fibreux présentant une couche intérieure (12) absorbante, une toile non-tissée formant une surface de couverture (10) sur une



face de ladite couche et une surface imperméable (14) sur la face de ladite couche opposée à ladite surface de couverture,  
caractérisé par la fait que

5 ladite couche intérieure absorbante (12) présente un poids de base situé généralement dans une plage allant d'environ 150 à 250 g/m<sup>2</sup>, comprend des microfibres (22, 24) présentant un pouvoir absorbant situé dans une plage allant d'environ 2152,85 à 9687,84 g/m<sup>2</sup> et un taux d'absorption situé dans la plage allant jusqu'à environ 2,5 secondes,

10 ladite surface de couverture comprenant une surface d'usure (10) contenant une toile non-tissée à filaments continus présentant un poids de base généralement situé dans une plage allant d'environ 15 à 200 g/m<sup>2</sup> et une résistance à l'abrasion d'au moins environ 3 1/2 heures, mesurée par modification du test de Tetrapod Walker, qui simule un trafic sur sol plat sous une charge finale de 1,1 kg, et

15 ledit paillason (20) étant lié par des zones de liaison (16) disposées selon un modèle espacé occupant jusqu'à peu près 25 % de la surface et présentant un taux d'influence correspondant au moins à environ 100 carrés de 6,35 mm par 6,35 mm de côté.

2. Paillason selon la revendication 1, dans lequel ladite couche intérieure (12) comprend un mélange desdites microfibres avec de 0 à 80 % d'autres fibres sélectionnées dans le groupe constitué de fibres de pulpes de bois et de fibres textiles coupées et de mélanges contenant de la pulpe de bois et des fibres textiles coupées.

3. Paillason selon la revendication 2, dans lequel lesdites microfibres de ladite couche intérieure absorbante (12) comprennent des microfibres de polypropylène soufflées à l'état fondu.

25 4. Paillason selon l'une des revendications 1 à 3, dans lequel ladite surface d'usure (10) comprend des filaments de Nylon.

5. Paillason selon l'une des revendications 1 à 4, dans lequel ladite surface (14) imperméable aux liquides est un film de polymère d'épaisseur située dans une plage allant d'environ 0,0217 à 0,217 mm.

30 6. Paillason selon la revendication 5, dans lequel le film (14) est un film de polyéthylène présentant une épaisseur située dans une plage allant d'environ 0,018 à 0,038 mm.

7. Paillason selon l'une des revendications 1 à 6, en combinaison avec un moyen (18, 26) destiné à maintenir sa position.

35 8. Paillason selon la revendication 7, dans lequel ledit moyen de maintien est un adhésif sensible à la pression (18), appliqué sur la surface imperméable (14).

9. Paillason selon la revendication 7, dans lequel ledit moyen de maintien est un support (26) destiné à contenir ledit paillason (20).

40 10. Paillason selon l'une des revendications 1 à 9, dans lequel ledit composant de paillason présente un pouvoir absorbant situé dans une plage d'environ 3229,28 à 5382,13 g/m<sup>2</sup> et un taux d'absorption situé dans une plage allant jusqu'à environ 0,5 sec.

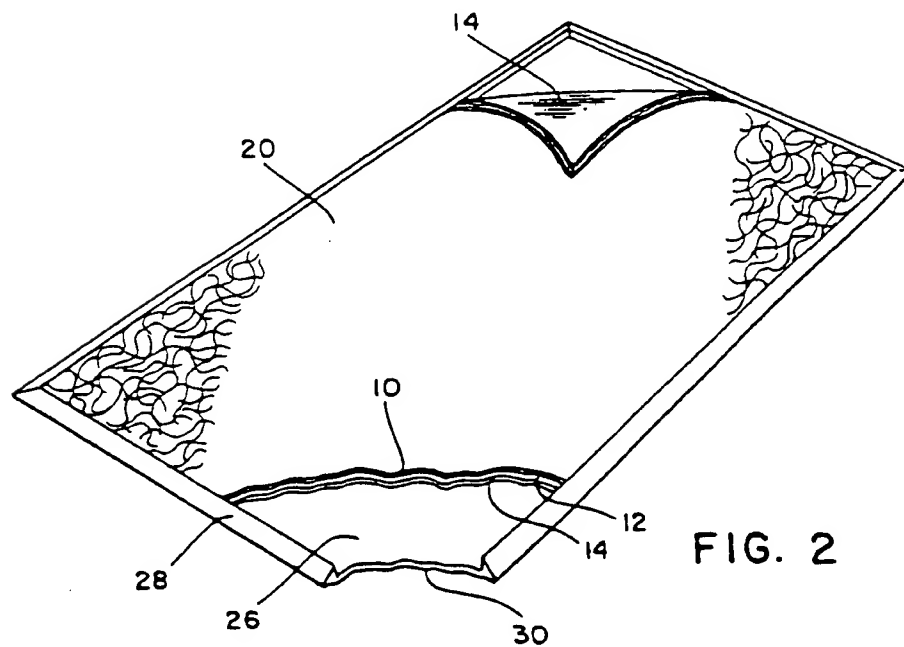
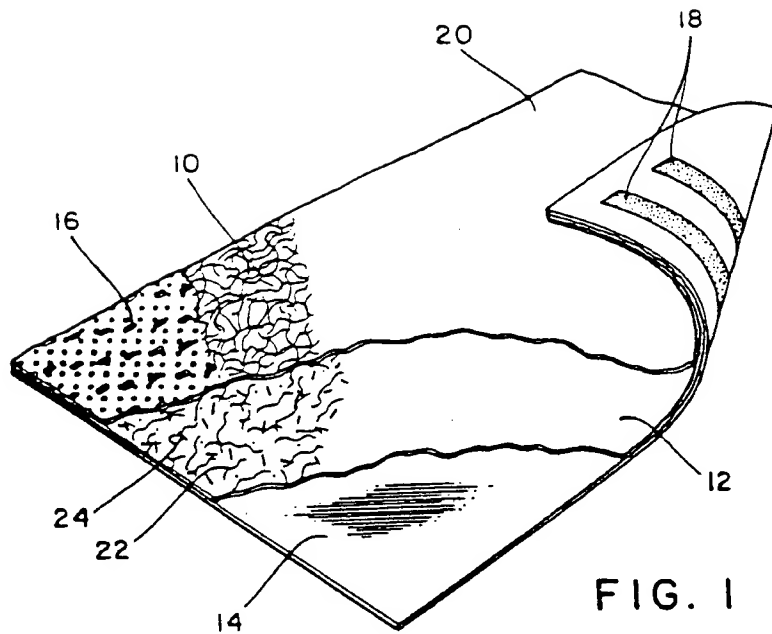
45 11. Paillason selon la revendication 3, dans lequel ladite surface d'usure (10) comprend des filaments de Nylon continus présentant un poids de base situé dans une plage allant d'environ 50 à 70 g/m<sup>2</sup>.

12. Paillason selon l'une des revendications 1 à 11, dans lequel ladite surface d'usure (10) présente une résistance à l'abrasion d'au moins environ 5 heures.

50 13. Paillason selon l'une des revendications 1 à 12, dans lequel ladite surface d'usure (10) présente une porosité située dans une plage allant d'environ 3,94 à 14,16 m<sup>3</sup>/min.

55 14. Paillason selon l'une des revendications 1 à 13, dans lequel ledit modèle de surfaces de liaison (16) occupe jusqu'à 10 % de la surface.

15. Paillason selon l'une des revendications 1 à 14, dans lequel ladite toile non-tissée à filaments continus de ladite surface d'usure (10) est liée par voie chimique.





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**EP 0 188 005 B1**

## Description

The present invention is directed to mats as outlined in the preamble of claim 1, useful for protecting floor surfaces from being soiled by contact with dirty liquids or other sources of dirt or contamination. A mat of this type is disclosed in US—A—4285075. The known mat comprises a re-usable or a disposable container-like holder enclosing a removable absorbent pad. The absorbent pad itself may be a sanitary pad of the type as developed for disposable diapers. The pad has a permeable cover sheet and an impermeable back sheet enclosing absorbent material. The known mat is adapted to be placed on the floor around the base of a commode or urinal. Since pads as used for disposable diapers are not very resistant to wear, the holder includes a grille work which is provided as top wear surface and is part of the holder structure.

Other known mats for use in areas especially subjected to wear are either durable and relatively costly or paper-like and intended to be discarded after a brief period of use.

Examples of the former range from carpeting, throw rugs, and other woven or tufted fabric mats while the latter types principally are made of paper-like materials such as are commonly found in new automobiles or runners used in protecting carpeting in newly constructed housing. There have, however, been investigated other structures designed for applications having somewhat more demanding requirements but where disposability or limited use require low costs. For example, U.S. Patent 3,856,610 to Bruneel dated 24 December 1974 describes a floor mat having an absorbent body portion which may be a woven or nonwoven fibrous fabric, fiberboard, paperboard, cotton or the like that is contained within a liquid impervious skin. The skin is perforated on the upper surface to permit liquid to pass through and into a series of aligned pores in the body member. It is alleged that liquid and small particles become entrapped in the pores and retained. U.S. Patent 4,421,809 to Bish, Sagel and Trinh dated 20 December 1983 describes a floor mat having a flocked surface that is bonded by means of a hydrophilic adhesive to an impermeable polymeric film. This combination may be further bonded to an absorbent secondary backing which may have an adhesive surface for improved hard floor stability. This structure may include a nonwoven primary backing in place of the film, but the film is preferred to maintain a thin structure. U.S. Patent 4,143,194 to Wihksne dated 06 March 1979 describes a disposable floor mat and holder combination wherein the mat may constitute tacky sheets, and the holder has means for reinforcing bevelled surfaces and may include interlocking means for combining mats to produce a larger surface.

In spite of these teachings, there is not commercially available, as far as is known, a floor mat that is sufficiently durable for use at entryways and the like without a grill work structure and yet is sufficiently low cost that its use may be consistent with disposability. Such a mat would avoid the high cost of woven and other relatively permanent structures and provide effective service. Furthermore, such a mat having a relatively limited life that could be used for advertising and promotional purposes is desired if available at a sufficiently low cost that it could be frequently changed.

It is therefore an object of the present invention to provide a mat which is sufficiently durable for use in entryways and the like and which is sufficiently low in cost that its use may be consistent with disposability.

A mat of this type is disclosed in claim 1.

The inventive mat can be used over an extended period compared with conventional more paper-like protective mats. The absorbent material is a fast-wicking microfiber web and preferably is a combination of thermoplastic polymeric microfibers and wood pulp fibers that not only is highly absorbent for both water and oil based liquids, but has a strong tendency to retain such materials and keep them from being redistributed on subsequent contact with the wear surface. The result of such combination is a highly effective floor mat that is inexpensive and suitable for many applications including building entryways, vending machine areas, clean rooms, hospitals, industrial laboratories, and the like.

Preferred embodiments of the inventive mat are described in dependent claims 2 to 16. Preferred embodiments for the wear surface include chemically bonded continuous filament webs, and preferred embodiments for the impervious film include films of polyolefins such as polypropylene and polyethylene. The combination is preferably bonded by a pattern application of sonic energy or heat and pressure.

In use the mat may be retained in place by means of adhesive applied to the impervious backing, or by means of a holder which is relatively permanent as compared with the mats which are intended to be changed from time to time depending on the extent of use.

Preferred embodiments of the invention are hereinafter described with reference to the drawings.

Figure 1 is an illustration shown in partial cross-section of a mat in accordance with the present invention.

Figure 2 is a view like that of Figure 1 showing the mat in combination with a holder.

The present invention provides an improved floor mat that is highly absorbent and finds applications as protection at building entryways, clean rooms, laboratories, hospitals, and the like where there is high traffic likely to bring in water, dirt, or other contaminants. The floor mat of the present invention is highly effective yet may be produced at a low cost consistent with disposability. Thus, the mat may include graphics of widely varying descriptions including advertisements, logos, and the like which may be changed frequently. These benefits and advantages are attained as a result of the specific structure of the mat which combines an abrasion-resistant nonwoven wear layer with a highly absorbent microfiber inner layer which may include cellulose or other fibers in combination with a bottom surface or film that is liquid impervious. In preferred embodiments the structure also includes means for retaining the mat either such

as through the use of adhesives and/or a mat holder. The combination may be bonded by various means but is preferably bonded by a patterned application of sonic energy or heat and pressure.

The abrasion-resistant wear surface in accordance with the invention is preferably a chemically, overall bonded continuous filament web. Such webs of nylon are available, for example, under the trademark Cerex<sup>®</sup> from Monsanto. It is important that the wear surface be highly resistant to abrasion and impart durability to the structure. Webs that are solution spun, solvent treated, or bonded by other chemical means are preferred for appearance purposes and for increased durability. While the basis weight of this wear layer may vary, for example, broadly within the range of about 15 to 200 grams per square meter, it is preferably within the range of about 50 to 70 grams per square meter. In order to satisfy the requirements of the present invention, the continuous filament wear layer web must have an abrasion resistance of at least about 3—1/2 hours and preferably at least about 5 hours as measured by a modification of the Tetrapod Walker Test which simulates flat floor traffic.

In accordance with this procedure, a plastic canister of 8.5 inches (21.59 cm) diameter and 8.5 inches (21.59 cm) length was fitted with rubber strips wrapped outside its circumference. A tetrapod was formed by welding together at equal angles four 1/4 inch (0.635 cm) screws three inches (7.62 cm) in length in the configuration of a large "jack". A neoprene #7 stopper was attached to each screw, and a lead weight attached to the vertex to make the final weight 1.1 Kg. To carry out the test, a section of mat material 8.5 inches (21.59 cm) by 24.75 inches (62.86 cm) was placed securely about the inner circumference of the canister. The tetrapod was then placed in the canister and the lid secured. The canister was placed on its side on a roller mill and the speed adjusted to 60 rpm. The sample was checked at 1/4 or 1/2 hour intervals for holes, rips or snags.

In addition, the wear surface, in accordance with the invention, will have a porosity in the range of from at least about 100 cubic feet (5.66 m<sup>3</sup>) per minute, preferably at least about 200 cubic feet per minute as measured using a Frazier Air-Permeability tester (Frazier Precision Instrument Company). To achieve desired integrity, the porosity normally will not exceed about 500 cubic feet (14.16 m<sup>3</sup>) per minute, however. In accordance with this procedure, a sample of sufficient size to extend several inches over all sides of the retaining ring was placed over the orifice having a diameter of 2.75 inches (6.98 cm). The retaining ring was fitted in position, and the clamp lowered and tightened. The power was adjusted until the inclined manometer oil column reached 0.5. When the inclined manometer had steadied at the proper level, a reading was taken from the vertical manometer and converted to a flow rate using the equipment calibration table. While other nonwoven chemically overall bonded webs are available of synthetic polymers such as polyolefins, polyesters, and the like, nylon webs, in the structure of the present invention are particularly advantageous in that they may easily be printed and resist discoloration or staining thus extending the useful life of the mat.

The absorbent microfiber layer structure is also an essential feature of the present invention. It preferably combines an intimate admixture of thermoplastic microfibers with other fibers such as wood pulp or natural or synthetic staple fibers having a basis weight in the range of from about 100 to 500 grams per square meter, preferably about 150 to 250 grams per square meter. The composition may range from about 0 to 80 percent of the other fibers, and is preferably in the range of from about 60 to 80 percent wood pulp fibers by weight. The microfibers are preferably thermoplastic polymers such as polyolefins, polyesters or polyamides having a diameter on the average in the range of up to about 15 microns and, preferably, in the range of up to about 10 microns.

The absorbent layer may be and is preferably formed in accordance with the process described in U.S. Patent 4,100,324 to Anderson, Sokolowski and Ostermeier dated 11 July 1978, which is incorporated herein by reference in its entirety. Thus, a matrix of meltblown microfibers is formed by depositing streams of molten polymer into an airstream and combining is accomplished by a secondary airstream containing, for example, wood pulp fibers. The combination of the airstreams causes the wood pulp fibers to be distributed throughout and held within the microfiber matrix. Preferred materials for the meltblown microfiber component include polyolefins such as polypropylene and polyethylene, although other microfibers may be used as will be apparent to those skilled in the art. If staple fibers are included, they may be polyester, polyolefins, polyamides or mixtures thereof, for example. However constituted, the absorbent microfiber web will have an absorbent capacity such that the capacity for the mat product will be generally in the range of at least about 1,000 gsm preferably at least about 1,400 gsm, absorbency rate generally in the range of up to about 2.5 seconds, preferably no greater than 0.5 seconds, and wicking rate generally so as to provide results for the mat combination in the range of at least about 100 quarter inch squares (squares of 6.35 mm by 6.35 mm) and preferably about at least 200 quarter inch squares (squares of 6.35 mm by 6.35 mm). Absorbency capacity was determined essentially in accordance with Federal Specification UU-T-00595 (GSA-FSS) Sections 4.4.4 and 4.4.6 by submerging a sample in water for 3 minutes, removing it, and allowing it to drip for 1 minute. Absorbency rate was determined essentially in accordance with Federal Specification UU-P-31b, 3 March 1949, Method 180 by measuring the time taken for a sample to completely absorb 0.1 ml. water. Wicking rate results were obtained by placing a 12 inch by 12 inch (30.48 cm by 30.48 cm) sample on a plexiglass surface, holding a pipet containing 5.0 ml of a solution of 0.02% aqueous FD & C red #4 dye 2 cm above the sample, and allowing the solution to flow vertically onto the sample. After five minutes, the number of quarter inch squares (mm<sup>2</sup>) of area covered by

the solution was measured. For the mat as a whole, the absorbency rate is generally within the range of up to 20 seconds, and, preferably, up to 10 seconds.

The liquid impervious surface for the combination in accordance with the invention is preferably a film selected from those which are suitable for combination with the other layers and yet provide the desired barrier properties. Such include, by way of example and not limitation, thermoplastic polymers such as polyolefins, polyesters and the like. Preferred for economic reasons as well as for improved bonding are polyethylene or polypropylene films. The film will, in general, have a thickness in the range of from about 0.5 to 5 mils (0,0217 mm to 0,217 mm), preferably in the range of from about 0.75 to 1.5 mils (0,019 mm to 0,038 mm) for the best combination of economics and performance. Essentially the film will need to be thick enough to withstand being subjected to repeated treading without breaking or rupturing and yet should be thin enough so as to not impart undue rigidity to the structure. The film may be applied as a separate layer, coextruded, or coated onto the absorbent web. Alternative means may be used to obtain imperviousness, such as calendering the exposed absorbent surface, or the bottom adhesive layer may be impervious.

Since the intended application as a floor mat will subject the combination to wet or otherwise slippery conditions, it is preferred that some means be provided to assure that the mat will maintain its position and not slip on the floor. This may be accomplished by means of a holder device, or, more economically, by means of tacky adhesive applied to the exposed surface of the liquid impervious film. Such adhesives may be selected from those pressure-sensitive adhesives which are known to retain their tack for an extended period under wet conditions. Such include, for example, latex acrylic adhesives. Preferably the adhesive constitutes Nacor-38-4529<sup>®</sup> acrylic latex available from National Starch and is applied overall or in a pattern covering up to about 100 percent of the exposed surface and is such as to result in easy releasability when it is desired to change the mat. For further discussion of such adhesives, reference may be had to U.S. Patent 4,421,809 to Bish, Sagel, and Trinh, for example, beginning at column 6, line 19, which is incorporated herein by reference.

When a holder is desired, it may be one of those known for use in holding floor mats. As such, it will generally have bevelled edges and be of a size such as to accommodate the mat without being so large as to permit the mat to be easily dislodged. If desired, retaining means may be incorporated in the holder to further ensure against undesired separation, or the mat may include an adhesive as above described for attachment to the holder. Other attachment means may be employed as will be apparent to those skilled in the art. If an adhesive is used, it will preferably be a permanently tacky pressure sensitive adhesive of the type described above and a release liner will preferably be used to protect the adhesive prior to the mat being placed in position. When it is desired to secure the mat, the release liner is removed, and the mat pressed into a desired position. Such release liners are known and may include plastic sheets such as 1 mil (0,0254 mm) thick polyethylene or a spunbonded nonwoven of 0.5 oz/square yard (16,95 g/m<sup>2</sup>), for example, or paper treated with a release coat of silicone, polytetrafluoroethylene or other strippable material.

Bonding of the composite may be accomplished by a variety of means including adhesives, heat and pressure, stitching or application of sonic energy. It is important, however, that bonding be accomplished in a manner that does not adversely affect the wear resistant properties of the spunbonded top surface or the absorbency and wicking properties of the microfiber mat. Also, since the spun-bonded surface must transmit liquid into the absorbent layer, the bonding must preserve the porosity or open structure of the web. Therefore, bonding is achieved in a pattern that will generally occupy up to about 25 percent of the surface and, preferably, up to about 10 percent of the surface. The pattern may comprise an open, disconnected pattern, or it may comprise a series of lines. If an open, disconnected pattern is used, it will generally be in a pattern of up to about 30 bonds per square inch (about 4,65 bonds per cm<sup>2</sup>) and preferably have up to about 20 bonds per square inch (about 3,1 bonds per cm<sup>2</sup>). If a line pattern is used, it will generally be in a pattern of up to about 10 lines per inch (about 4 lines per cm) on the average in any direction and preferably average up to about 5 lines per inch (about 2 lines per cm) in any direction. The preferred means for achieving bonding is application of sonic energy since that has been found to be most effective for combinations of the total basis weight of the present invention and for achieving bonding of different polymer components. For some applications, combinations of the different bonding steps may be employed.

Turning to the drawings, Figure 1 illustrates a mat in accordance with the present invention shown in partial cross-section. As illustrated, the mat 20 includes wear surface spunbonded layer 10, absorbent layer 12 including microfibers 22 and wood pulp fibers 24 and liquid impervious film 14. The combination is united by bond areas 16 and includes adhesive strips 18 for attachment to the floor surface.

Figure 2 is a view like that of Figure 1 further illustrating the embodiment wherein the mat 20 is combined with holder 26 which may be of a variety of materials suited for the intended use. Thus, if intended as a permanent embodiment, the support holder 26 may be of a durable material such as rubber or, if used only temporarily, may be of a less expensive material such as polystyrene, polypropylene, polyurethane or the like. In any event, holder 26 preferably includes bevelled sides 28 and will have a gripping under surface 30 to avoid slipping on a wide variety of floor surfaces, such as carpet, tile, linoleum, concrete, wood and so forth. In this application, as shown, the impervious surface 14 may be free of adhesive, or, if desired, adhesive may be used to secure the mat to the holder.

The mats of the present invention either alone or in combination with the holder, will find a wide variety of applications. For example, they may be used as either temporary or permanent fixtures at building entryways to protect against inclement weather or otherwise tracking in outside dust and dirt. Also they may be employed in industrial applications at entryways to cleanrooms, laboratories, or as undermats for automotive repair. Further, they may be used in hospitals to reduce opportunities for contamination. Other uses including household applications will be apparent to those skilled in the art. For many of these applications the particular advantage of the printability of a nylon or other receptive outer surface may be used to achieve advertising or other promotional purposes such as safety messages or the like. The low cost of the mats in the present invention make them particularly suitable since they may be changed to impart different messages on a relatively frequent basis.

#### Example

A mat in accordance with the present invention was constructed generally as illustrated in Figure 1. For the outside wear surface, a nylon web obtained from Monsanto under the trademark Cerex<sup>1</sup>® was used. This web was formed of chemically bonded 3 denier continuous nylon filaments and had a basis weight of 68 grams per square meter and a porosity of 140 cubic feet (3.94 m<sup>3</sup>) per minute. For the absorbent layer a web produced generally in accordance with U.S. Patent 4,100,324 to Anderson, Sokolowski and Ostermeier and, in particular, with reference to Example 1, was employed. This layer had a basis weight of 190 grams per square meter and included 30 percent polypropylene microfibers and 70 percent wood pulp. It had an absorbency rate that was essentially instantaneous. For the liquid impervious film layer, a film of polyethylene having a basis weight of about 31 grams per square meter and thickness of 1.5 mils (0.038 mm) was employed. The combination was bonded by application of sonic energy at a frequency of 20 to 40 kilohertz and in a pattern corresponding to the gross pattern illustrated in U.S. Patent 4,374,888 to Bornslaeger dated 22 February 1983, Figure 3 having a frequency of about 20 bonds per square inch (about 3.1 bonds per cm<sup>2</sup>) and percent coverage of about 8 percent. The surface of the mat was printed with a decorative pattern.

In use the mat of this Example was placed in a rectangular holder and located at the entryway to offices and factories in the northeast section of the United States during a period of highly inclement weather including two blizzards and one week of rain for a total precipitation of about 15 inches. After a period of 31 days with an estimated traffic of 3,000 to 5,000 persons, the mat was still fully intact although the appearance had deteriorated due to dirt retention.

The mat material of this example was further tested to determine its absorbency capacity and wicking rate. For comparison, similar tests were performed on other conventional paper and nondisposable cloth mat materials. The results are shown in the following Table.

TABLE

	Sample	Water rate (seconds)	Water capacity gsm	Wicking 1/4" squares (squares of 6,35 mm by 6,35 mm)	Tetrapod
5					
10	Paper (117.6 gsm)	13.4	187.6	754	3 hours— one hole considerable wear
15	Calendered paper (92.1 gsm)	Did not absorb	92.4	Did not absorb	5 hrs.*
	Calendered paper (117 gsm)	11.9	199.3	579	5 hrs.*
20	Paper (83.7 gsm)	0.3	823.6	136	1 hour—failed holes
	Paper (306.1 gsm)	19.7	1881.6	50	1 hr 10 min failed—holes— much pilling
25	Air laid paper (75.6 gsm)	Instant	694.3	167	5 min—failed— holes
30	Rental-cotton (3022 gsm)	37.2	3701.9	Essentially** Zero	5 hrs—some pilling, no holes
35	Rental-nylon (2660 gsm)	35.3	4022.0	Essentially** Zero	Not done
	Rental-cotton used (2011 gsm)	40.0	2257.0	31	Not done
40	Example (315 gsm)	7.1	1487.8	143	5 hrs—some pilling, no holes

\*Due to paper being highly calendered, test results are not believed to reflect true abrasion resistance.  
 \*\*"Z" directional transfer only.

These data demonstrate that the mats of the present invention provide benefits approaching and, in some cases, exceeding those of the more expensive reusable cloth ones at a cost consistent with disposability. While individual results in some cases do not measure up to those of competitive disposable products, taken as a whole, and particularly as shown by tests in use, the floor mats of the present invention are preferred over such conventional disposable products. The engineered construction of the mats of the present invention extend performance by wicking liquid and soil contained therein away from the exposed surface while preventing its transfer through the impervious bottom surface. The top wear layer protects the absorbent medium while permitting the soil to penetrate to avoid surface build-up and further contributes to extend the useful life of the mat.

Thus it is apparent that there has been provided, in accordance with the invention, an improved floor mat construction that fully satisfies the objects, aims, and advantages set forth above. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description.

#### Claims

1. A protective mat (20), comprising a fiber material having an absorbent inner layer (12), a nonwoven



web forming cover surface (10) at one side of said inner layer and an impervious surface (14) on the side of said inner layer opposite said cover surface, characterized by

said absorbent inner layer (12) having a basis weight generally in the range of from about 100 to 500 g/m<sup>2</sup> comprising microfibers (22, 24) having an absorbency capacity in the range of from about 2152,85 to

5 9687,84 g/m<sup>2</sup> (200 to 900 g/sq. ft.) and absorbency rate in the range of up to about 2.5 seconds, said cover surface comprising a wear surface (10) containing a continuous filament nonwoven web having a basis weight generally in the range from about 15 to 200 g/m<sup>2</sup> and an abrasion resistance of at least about 3 1/2 hours, and

10 said mat (20) being bonded by a spaced pattern of bond areas (16) occupying up to about 25% of the surface area and having a wicking rate in the range of at least about 100 squares of 6,35 mm by 6,35 mm (100 quarter-inch squares).

2. The mat of claim 1 wherein said inner layer (12) comprises an admixture of said microfibers with 0 to 80% of other fibers selected from the group consisting of wood pulp fibers and staple fibers and mixtures containing wood pulp and staple fibers.

15 3. The mat of claim 2 wherein said microfibers of said absorbent inner layer (12) comprise meltblown polypropylene microfibers.

4. The mat of any of claims 1 to 3 wherein said wear surface (10) comprises nylon filaments.

5. The mat of any of claims 1 to 4 wherein said liquid impervious surface (14) is a polymeric film having a thickness in the range of from about 0,0217 to 0,217 mm (0.5 to 5 mils).

20 6. The mat of claim 5 wherein the film (14) is a polyethylene film having a thickness in the range of from about 0,018 to 0,038 mm (0.75 to 1.5 mils).

7. The mat of any of claims 1 to 6 in combination with means (18, 26) to maintain its position.

8. The mat of claim 7 wherein said maintaining means is a pressure-sensitive adhesive (18) applied to

the impervious surfaces (14).

25 9. The mat of claim 7 wherein said maintaining means is a holder (26) to contain said mat (20).

10. The mat of any of claims 1 to 9 wherein said microfiber inner layer has a basis weight in the range of from about 150 to 250 g/m<sup>2</sup>.

30 11. The mat of any of claims 1 to 10 wherein said mat component having an absorbency capacity in the range of from about 3229,28 to 5382,13 g/m<sup>2</sup> (300 to 500 g/sq. ft.) and absorbency rate in the range of up to about 0.5 sec.

12. The mat of claim 3 wherein said wear surface (10) comprises continuous nylon filaments having a basis weight in the range of from about 50 to 70 g/m<sup>2</sup> (1.5 to 2.0 oz/yds<sup>2</sup>).

13. The mat of any of claims 1 to 12 wherein said wear surface (10) has an abrasion resistance of at least about 5 hours.

35 14. The mat of any of claims 1 to 13 wherein said wear surface (10) has a porosity in the range of from about 3,94 to 14,16 m<sup>3</sup>/min (140 to 500 cubic feet per minute).

15. The mat of any of claims 1 to 14 wherein said pattern of bond areas (16) occupies up to 10% of the surface area.

40 16. The mat of any of claims 1 to 15 wherein said continuous filament nonwoven web of said wear surface (10) is bonded chemically.

#### Patentansprüche

1. Schutzmatte (20) aus einem Fasermaterial mit einer absorbierenden, inneren Schicht (12), einer ungewebten Bahn, die eine Abdeckschicht (10) an einer Seite der inneren Schicht bildet, und einer undurchlässigen Oberfläche (14), an der der Abdeckfläche gegenüberliegenden Seite der inneren Schicht, 45 gekennzeichnet durch die absorbierende innere Schicht (12), die ein Basisgewicht aufweist, das im wesentlichen im Bereich zwischen etwa 100 bis 500 g/m<sup>2</sup> liegt, Microfasern (22, 24) mit einer Absorptionskapazität im Bereich von etwa 2152,85 bis 9687,84 g/m<sup>2</sup> (200 bis 900 g/sq. ft.) und mit einer Absorptionsrate im Bereich von bis zu etwa 2,5 Sekunden enthält, durch eine Abdeckfläche, die eine Verschleißfläche (10) aufweist, die eine nicht gewebte aus kontinuierlichen Filamenten mit einem 50 Basisgewicht im allgemeinen im Bereich zwischen etwa 15 bis 200 g/m<sup>2</sup> und einen Abriebwiderstand von mindestens etwa 3 1/2 Stunden, und wobei die Matte (20) durch ein beabstandetes Muster von Verbindungsflächen (16) verbunden ist, das bis zu 25 Prozent der Oberfläche einnimmt, und eine (Saug-)Rate im Bereich von mindestens hundert Quadraten mit 6,35 mm×6,35 mm (100 Viertel inchquadrate) 55 aufweist.

2. Matte nach Anspruch 1, wobei die innere Schicht (12) eine Mischung der Microfasern mit 0 bis 80 Prozent von anderen Fasern enthält, die aus der Gruppe ausgewählt wurden, die Fasern aus Holzpulpe und Stapelfasern und Mischungen aus Holzpulpe- und Stapelfasern enthält.

3. Matte nach Anspruch 2, wobei die Microfasern der absorbierenden inneren Schicht (12) 60 schmelzgeblasene Polypropylen-Microfasern enthalten.

4. Matte nach einem der Ansprüche 1 bis 3, wobei die Verschleißfläche (12) Nylon-Filamente enthält.

5. Matte nach einem der Ansprüche 1 bis 4, wobei die flüssigkeits undurchlässige Oberfläche (14) ein Polymerfilm mit einer Dicke im Bereich von etwa 0,0217 bis 0,217 mm (0,5 bis 5 mils) ist.

6. Matte nach Anspruch 5, wobei der Film (14) ein Polyethylenfilm mit einer Dicke im Bereich von etwa 65 0,018 bis 0,038 mm (0,75 bis 1,5 mils) ist.

7. Matte nach einem der Ansprüche 1 bis 6 in Verbindung mit einer Einrichtung (18, 26) um ihre Lage aufrechtzuerhalten.
8. Matte nach Anspruch 7, wobei die Einrichtung zum Aufrechterhalten ein drucksensibler Kleber (18) ist, der auf die undurchlässige Oberfläche (14) aufgebracht ist.
- 5 9. Matte nach Anspruch 7, wobei die Einrichtung zum Aufrechterhalten ein die Matte (20) enthaltender Halter (26) ist.
10. Matte nach einem der Ansprüche 1 bis 9, wobei die innere Micorfaser-Schicht ein Basisgewicht im Bereich von etwa 150 bis 250 g/m<sup>2</sup> hat.
11. Matte nach einem der Ansprüche 1 bis 10, wobei der Mattenbestandteil eine Absorptionsfähigkeit  
10 im Bereich von etwa 3229,28 bis 5382,13 g/m<sup>2</sup> (300 bis 600 g/sq. ft.) und eine Absorptionsrate im Bereich von bis zu etwa 0,5 Sekunden hat.
12. Matte nach Anspruch 3, wobei die Verschleißoberfläche (10) kontinuierliche Nylonfilamente mit einem Basisgewicht im Bereich von etwa 50 bis 70 g/m<sup>2</sup> (1,5 bis 2,0 oz/yds<sup>2</sup>) enthält.
13. Matte nach einem der Ansprüche 1 bis 12, wobei die Verschleißoberfläche (10) einen  
15 Abriebwiderstand von mindestens etwa 5 Stunden hat.
14. Matte nach einem der Ansprüche 1 bis 13, wobei die Verschleißoberfläche (10) eine Porosität im Bereich von etwa 3,94 bis 14,16 m<sup>3</sup>/min (140 bis 500 cubic feet pro Minute).
15. Matte nach einem der Ansprüche 1 bis 14, wobei das Muster verbundener Flächen (16) bis zu 10 Prozent der Oberfläche einnimmt.
- 20 16. Matte nach einem der Ansprüche 1 bis 15, wobei die Fließbahn aus kontinuierlichen Filamenten der Verschleißoberfläche (10) chemisch gebunden ist.

# Revendications

- 25 1. Paillasson protecteur (20) comprenant un matériau fibreux présentant une couche intérieure (12) absorbante, une toile non-tissée formant une surface de couverture (10) sur une face de ladite couche et une surface imperméable (14) sur la face de ladite couche opposée à ladite surface de couverture, caractérisé par le fait que  
ladite couche intérieure absorbante (12) présente un poids de base situé généralement dans une plage  
30 allant d'environ 100 à 500 g/m<sup>2</sup> comprend des microfibras (22, 24) présentant un pouvoir absorbant situé dans une plage allant d'environ 2152,85 à 9687,84 g/m<sup>2</sup> et un taux d'absorption situé dans la plage allant jusqu'à environ 2,5 secondes,
- ladite surface de couverture comprenant une surface d'usure (10) contenant une toile non-tissée à filaments continus présentant un poids de base généralement situé dans une plage allant d'environ 15 à  
35 200 g/m<sup>2</sup> et une résistance à l'abrasion d'au moins environ 3 1/2 heures, et  
ledit paillasson (20) étant lié par des zones de liaison (16) disposées selon un modèle espacé occupant jusqu'à peu près 25% de la surface et présentant un taux d'influence correspondant au moins à environ à 100 carrés de 6,35 mm per 6,35 mm de côté.
2. Paillasson selon la revendication 1, dans lequel ladite couche intérieure (12) comprend un mélange  
40 desdites microfibras avec de 0 à 80% d'autres fibres sélectionnées dans le groupe constitué de fibres de pulpes de bois et de fibres textiles coupées et de mélanges contenant de la pulpe de bois et des fibres textiles coupées.
3. Paillasson selon la revendication 2, dans lequel lesdites microfibras de ladite couche intérieure absorbante (12) comprennent des microfibras de polypropylène soufflées à l'état fondu.
- 45 4. Paillasson selon l'une des revendications 1 à 3, dans lequel ladite surface d'usure (10) comprend des filaments de nylon.
5. Paillasson selon l'une des revendications 1 à 4, dans lequel ladite surface (14) imperméable aux liquides est un film de polymère d'épaisseur située dans une plage allant d'environ 0,0217 à 0,217 mm.
6. Paillasson selon la revendication 5, dans lequel le film (14) est un film de polyéthylène présentant  
50 une épaisseur située dans une plage allant d'environ 0,018 à 0,038 mm.
7. Paillasson selon l'une des revendications 1 à 6, en combinaison avec un moyen (18, 26) destiné à maintenir sa position.
8. Paillasson selon la revendication 7, dans lequel ledit moyen de maintien est un adhésif sensible à la pression (18), appliqué sur la surface imperméable (14).
- 55 9. Paillasson selon la revendication 7, dans lequel ledit moyen de maintien est un support (26) destiné à contenir ledit paillasson (20).
10. Paillasson selon l'une des revendications 1 à 9, dans lequel ladite couche intérieure de microfibras présente un poids de base situé dans une plage d'environ 150 à 250 g/m<sup>2</sup>.
11. Paillasson selon l'une des revendications 1 à 10, dans lequel ledit composant de paillasson  
60 présente un pouvoir absorbant situé dans une plage d'environ 3229,28 à 5382,13 g/m<sup>2</sup> et un taux d'absorption situé dans une plage allant jusqu'à environ 0,5 sec.
12. Paillasson selon la revendication 3, dans lequel ladite surface d'usure (10) comprend des filaments de nylon continus présentant au poids de base situé dans une plage allant d'environ 50 à 70 g/m<sup>2</sup>.
13. Paillasson selon l'une des revendications 1 à 12, dans lequel ladite surface d'usure (10) présente  
65 une résistance à l'abrasion d'au moins environ 5 heures.

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14. Paillasson selon l'une des revendications 1 à 13, dans lequel ladite surface d'usure (10) présente une porosité située dans une plage allant d'environ 3,94 à 14,16 m<sup>3</sup>/min.

15. Paillasson selon l'une des revendications 1 à 14, dans lequel ledit modèle de surfaces de liaison (16) occupe jusqu'à 10% de la surface.

5 16. Paillasson selon l'une des revendications 1 à 15, dans lequel ladite toile non-tissée à filaments continus de ladite surface d'usure (10) est liée par voie chimique.

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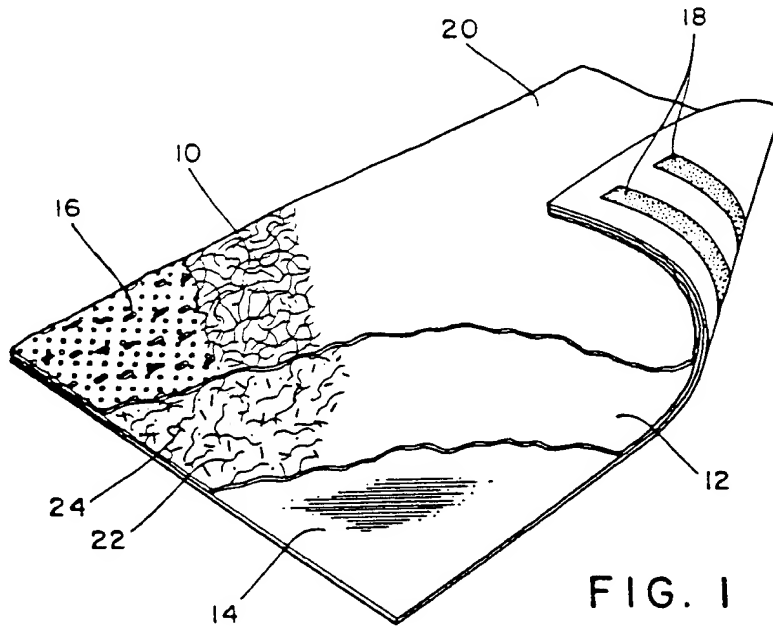


FIG. 1

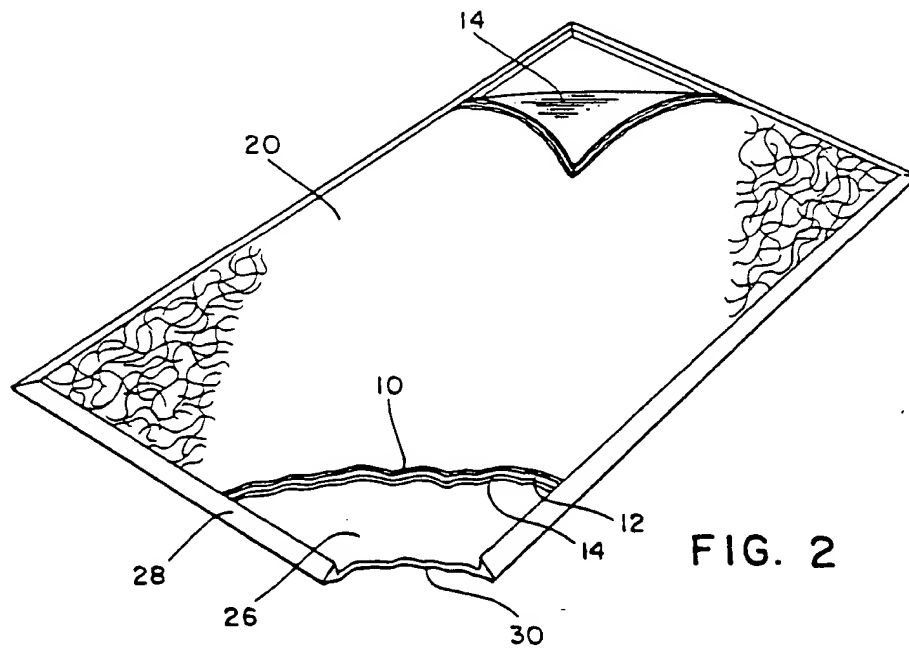


FIG. 2